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TAXONOMIC GUIDES TO ARCTIC ZOOPLANKTON (VI): APPENDICULARIANS OF THE CENTRAL ARCTIC MYSIDS OF THE ARCTIC OCEAN AND CONFLUENT SEAS FIELD GUIDE TO ARCTIC ZOOPLANKTONIC CRUSTACEANS OSTRACODS OF THE CENTRAL ARCTIC

Yuk Maan Leung

University of Southern California

Prepared for:

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October 1972

UNIVERSITY OF SOUTHERN CALIFORNIA

Department of Biological Sciences

TAXONOMIC GUIDES TO ARCTIC ZOOPLANKTON (VI):

Appendicularians of the Central Arctic

Mysids of the Arctic Ocean and Confluent Seas

Field Guide to Arctic Zooplanktonic Crustaceans

Ostracods of the Central Arctic

by

Yuk-maan Leung

Technical Report #2 (1972)
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13. ABSTRACT

"Taxonomic Guides to Arctic Zooplankton (VI)" is the last in the series of practical taxonomic guides to zooplankton prepared by this Project to meet the needs of non-taxonomists involved with Arctic fauna. Material presented in this guide is based upon results of research by investigators associated with this Project and its precursors since 1952.

This compilation is composed of information on the five species of ostracods and five species of appendicularians found amongst central Arctic zooplankton; mysids from the central Arctic and peripheral seas; and a general guide to Arctic zooplanktonic crustaceans.

Each guide contains dichotomous keys and complementary illustrations, special notes on individual species, and selected references to literature pertaining to the included groups.

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Introduction

A comprehensive, yet practical guide to pertinent fauna is a basic requirement of any program dealing with quantification or physiological investigation of organism in a given locality. This compilation is the sixth and last in a series prepared by this Project to fulfill this need for the investigation of species which constitute the zooplankton of the Arctic Basin. Complete reference to these guides is listed on page 2.

The series provides dichotomous keys supported by illustrations as well as notes on distribution and morphology. Emphasis is on the recognition of adults on the field with little or no dissection. A detailed reference list is also provided with each group for the benefit of anyone requiring further information.

This issue features the species of planktonic appendicularians (larvaceans) and ostracods found in the central Arctic as well as the mysid fauna of the Arctic Ocean and peripheral seas. A generalized guide to the different zooplanktonic crustaceans is also included to promote efficient distinction of animals of similar appearance.

Technical Reports in Zooplankton Series

Zooplankton (I): Amphipods of Central Arctic. . . J.R. Tencati
Euphausiids of the Arctic Basin and peripheral Seas. . . Y.M. Leung

USC Technical Report 2 (1970)

Zooplankton (II): Medusae of the Central Arctic. . W. D. Shirley and Y.M. Leung
Siphonophores of the Central Arctic. . .Y.M. Leung
Ctenophores of the Central Arctic

USC Technical Report 3 (1970)

Zooplankton(III): Species of Arctic Ocean Chaetognaths. . . . . .J.K. Dawson
Pteropods of the Central Arctic. Y.M. Leung
Decapods of the Central Arctic. .Y.M. Leung, A.Havens and W. Rork

USC Technical Report 4 (1971)

Zooplankton (IV): Key to the Calanoid Copepods of the Central Arctic Ocean. . . .J.Vidal

USC Technical Report 5 (1971)

Zooplankton (V): Pelagic Polychaetes of the Central Arctic Basin. . . . . .D.R. Yingst

USC Technical Report 1 (1972)

Zooplankton (VI): Appendicularians of the Central Arctic. . . . . .Y.M. Leung
Mysids of the Arctic Ocean and Confluent Seas
Ostracods of the Central Arctic
Field Guide to Arctic Zooplanktonic Crustaceans

USC Technical Report 2 (1972)

Appendicularians of the Central Arctic

Introduction

The appendicularians are common, minute zooplankton ranging from 0.7 to 8.0 mm in length in the Arctic Ocean. These animals are almost entirely transparent except for their gonads which are red in live or newly preserved specimens. Due to their delicacy and transparency, appendicularians can be easily examined only when alive or fresh. As this is often not possible with Arctic fauna, special methods are needed for handling preserved specimens. A few techniques used in the USC Arctic laboratory are listed in the "notes" section of this guide.

The general structure of the body consists of two main parts, the trunk and the tail. Classification is chiefly based upon the shapes and the relative positions of the digestive organs in the trunk; the relative positions of the subchordal cells of the tail are also important. Some species secrete and live attached to gelatinous "houses" much larger than their bodies*.

This compilation is based upon the findings of Dr. A. Bückmann, who very kindly examined and identified appendicularians from T-3 collections taken during 1970-1971. The illustrations were re-drawn from material provided by him.

This work is the first intensive effort to identify appendicularians of the central Arctic Ocean. Since it is limited in time and geographical scope, the record on this group is by no means complete. Further examination of many more fresh collections, preferably on the field, are still necessary.

* see notes.

Species of Arctic Ocean Appendicularians

Five species have been identified in collections from the central Arctic Ocean, namely, Oikopleura vanhoeffeni, O. labradoriensis, Fritillaria borealis acuta, F. haplostoma, and F. tenella. The Oikopleura spp. were found frequenting depths from 900 meters to the surface, while Fritillaria spp. were taken mainly in the 200 to 100 meter depth range. Adults of all species except F. tenella were found commonly in tows taken from February to September. F. tenella is rare.

The presence of F. haplostoma in the Arctic is a new record as this species has previously been found to occur only along the west coast of Africa and the Mediterranean Sea.

Field Guide to the Appendicularians of the Central Arctic Ocean

1a. Trunk elongated with a slender waist; organs free in body cavities; spiracles just behind the endostyle; tail often bifurcated. . . . . *Fritillaria* (Fig. 1b)

(a) Mouth with pointed upper lip; posterior part of tail with a pair of jug-shaped amphichordal cells; tail widely bifurcated. (1.2 mm). . . . . *F. tenella* (Fig. 4a, b)

(b) Musculature 3 to 5 times broader than the notochord, and tapers to a point at the end; tail bifurcated (.7-1.8 mm). . . . . *F. borealis acuta* (Fig. 6a, b)

(c) Mouth simple; intestine with 2 blind sacs on side; spiracles comparatively wide and elliptical; tail tapers at the tip; musculature narrow (1.0-1.3 mm). . . . . *F. haplostoma* (Fig. 5a, b)

1b. Trunk ovoid; organs tightly packed; spiracles far behind the endostyle; tail not bifurcated. . . . . *Oikopleura* (Fig. 1a)

(a) Trunk comparatively compact; stomach roughly pentagonal with a blind sac; large, bladder-like subchordal cells forming a single line on the right side of musculature (.8-1.0 mm). . . . . . . *O. labradoriensis* (Fig. 3a, b)

(b) Dorsal line of trunk curved, bending suddenly toward the mouth; stomach rounded without a blind sac; very small subchordal cells scattered in the posterior of musculature (2.0-8.0mm). . . . . . . *O. vanhoeffeni* (Fig. 2a, b)

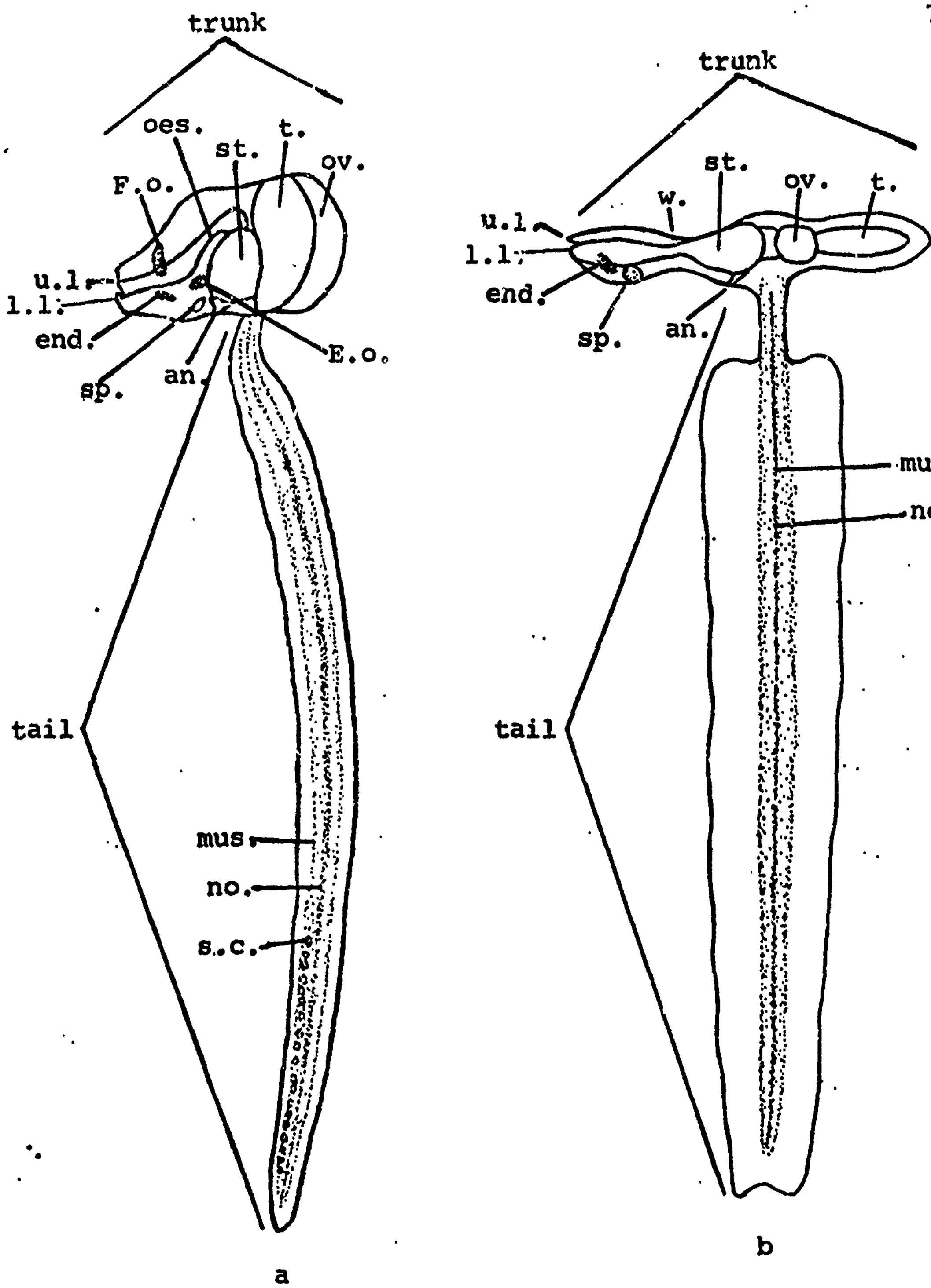
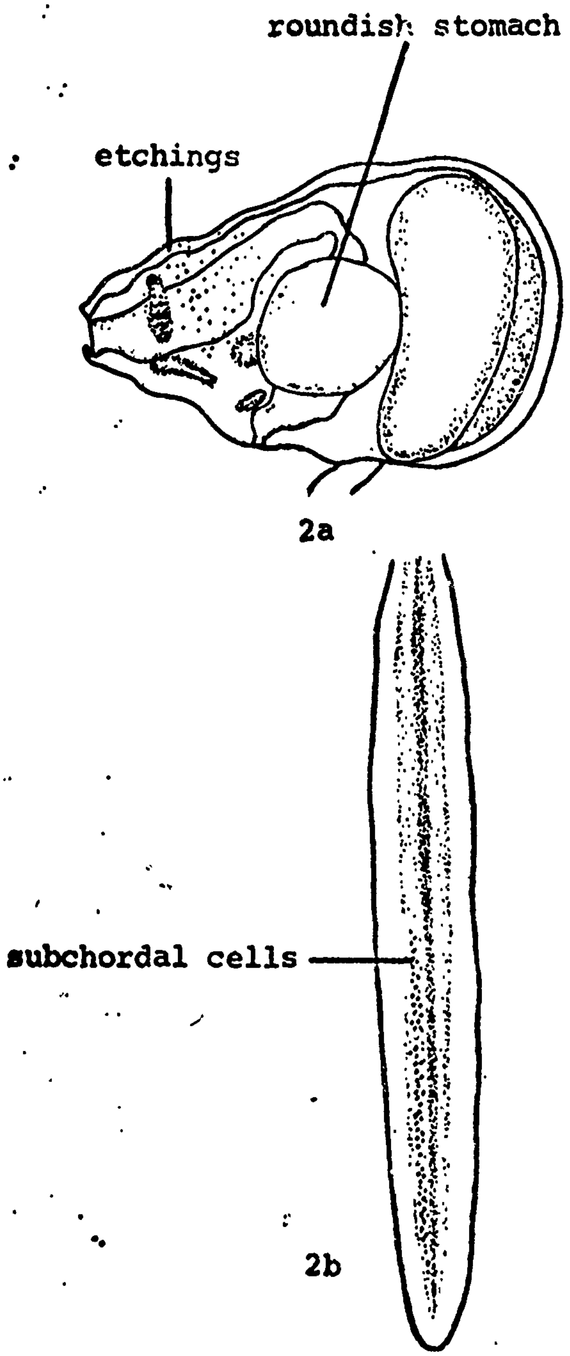


Fig. 1. Diagrammatic appendicularians. a. Oikopleura sp. X 9; b. Fritillaria sp. X 50. an., anus; E.o., Eison's oikoplast; end., endostyle; F.o., Fol's oikoplast; l.l., lower lip; mus., musculature; no., notochord; oes., oesophagus; ov., ovary; s.c., subchordal cells; sp., spiracle; st., stomach; t., testis; u.l., upper lip; w., waist.



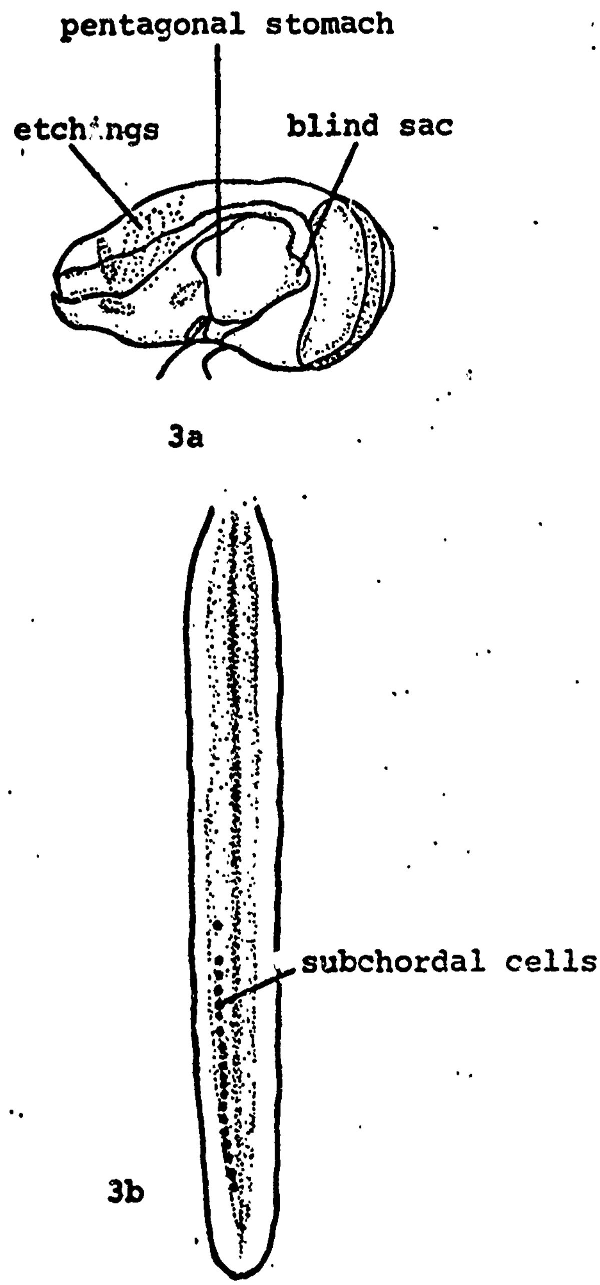
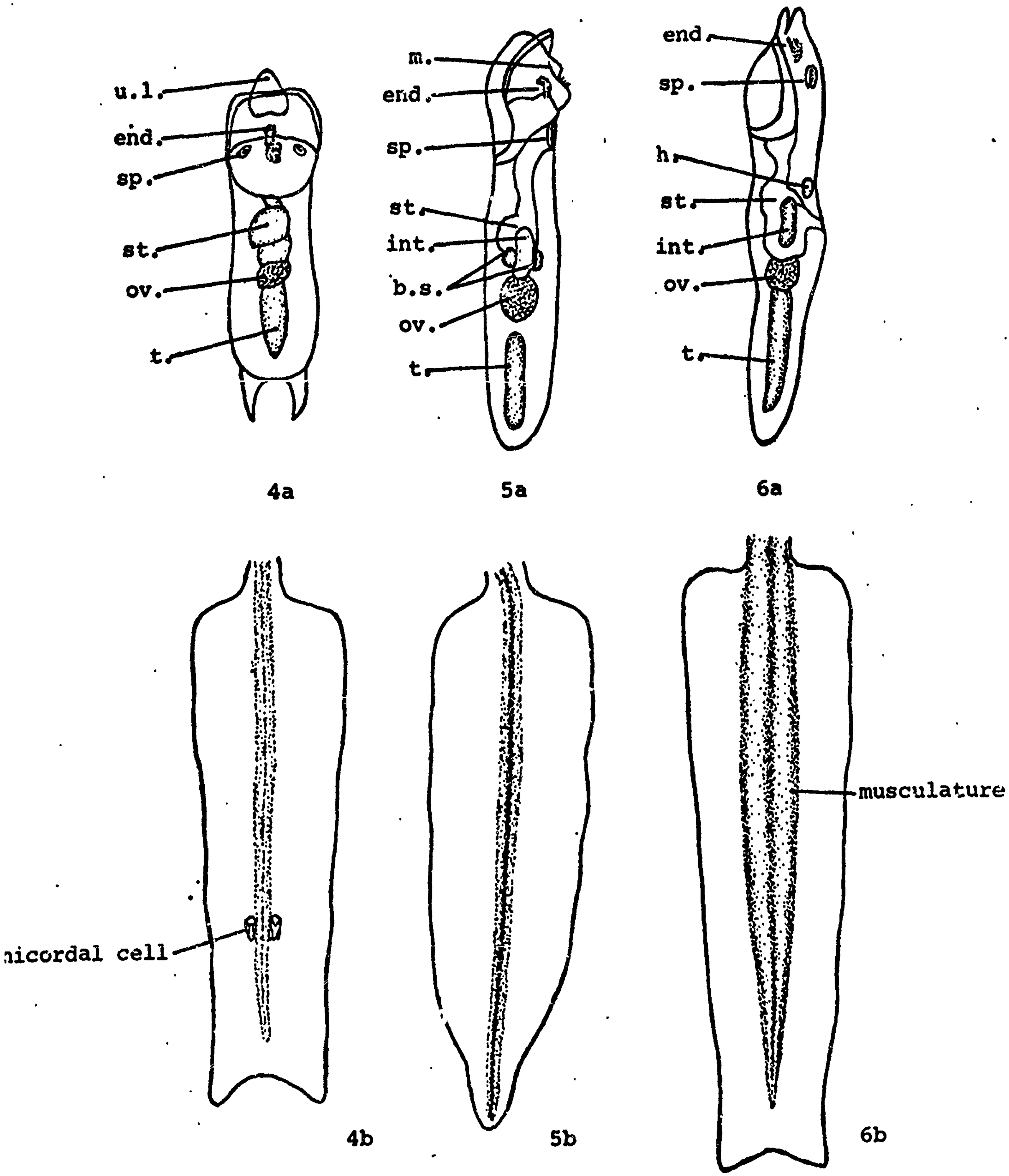


Fig. 2

<u>Oikopleura</u> <u>vanhoeffeni</u>.
2a. trunk, left side view X 12;
2b. tail, frontal view X 6.

Fig. 3

<u>Oikopleura</u> <u>labradoriensis</u>.
2a. trunk in left side view, X 12; 2b. tail frontal view, X 6.



Figs. 4, 5, and 6. Fritillaria tenella, F. haplostoma, and F. borealis acuta.
a. trunk, X 55: 4a. ventral view, 5a. right side view, 6a. right side view. b.s., blind sac; h., heart; int., intestine; m., mouth. b. tail, X 75: frontal view.

Notes:

1. Appendicularian "house"-Members of the genera *Oikopleura*, *Appendicularia*, and *Kowlewskai* secrete a gelatinous material which completely encloses the body as a "house". The animal is attached to the "house" but is outside of it. This structure serves as the concentrating mechanism in this filter feeding organism, and is discarded as it becomes clogged. In *Oikopleura*, the structure is egg-shaped with a projecting peak and is much larger than the body of the animal. (Barnes, 1964) The epidermis of the anterior part of the trunk is specialized as oikoplastic epithelium(Fol's Oikoplast, Fig. 1a) which secretes the gelatinous material (Berrill, 1950).
   Arctic specimens have been found detached from their houses and hence have not been illustrated with them.

2. *Oikopleura vanhoeffeni* can be distinguished from *O. labradoriensis* when alive by the arrangement of minute etchings in the gelatinous mass of the house. These marks are located between the stomach and the Fol's Oikoplast (schematic in Figs. 2a, b). Well preserved animals also retain this character.

3. Technique for handling preserved specimens-Animals preserved for more than a week or two will be almost entirely transparent and very fragile. A drop each of glycerine and tincture of iodine added to the preservative surrounding the specimen on a microscope slide will make the outlines of the organs visible and the animal easier to handle. The visibility of the structures, especially the subchordal cells, may be improved by staining the animal with 5% alum haematoxylin or 5% eosin Y in 90% alcohol for 2 to 3 minutes. Never fix or preserve the appendicularian in alcohol as it will shrink and harden beyound identification.

Classification*

Phylum Chordata

Class Appendicularia

Family Appendiculariidae

Genus *Fritillaria*

F. borealis acuta Lohmann and Buckmann
F. tenella Lohmann
F. haplostoma Fol

Genus *Oikopleura*

O. vanhoeffeni Lohmann
O. labradoriensis Lohmann

* Bückmann's classification.

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Mysids of the Central Arctic

and

Confluent Seas

Introduction

The marine mysid fauna of the Arctic has as yet been poorly sampled because of the lack of efficient collection techniques which can overcome plankton capable of rapid swimming speeds. Plankton collections by workers on this Project since 1959 have contained four species, all present in the peripheral seas, but only two of which have been also found in the central Arctic Ocean. Bottom dredges off northeastern Greenland have revealed three benthic species.

In addition to the usual key to marine plankton species, all marine mysids on record from the Arctic Ocean and peripheral seas have been included in this guide. Separate dichotomous keys supported by illustrations have been provided for the pelagic and benthic species. Generic identification has been emphasized in order to provide the flexibility needed in the event that the introduction of new collection techniques makes the collection of even more species possible.

Included is a reprint of a publication by Mr. S. R. Geiger, formerly of this Project, which has served as the major basis for this guide.

Bull. So. Calif. Acad. Sci. 68(2): 103-111, 1969

DISTRIBUTION AND DEVELOPMENT OF MYSIDS (CRUSTACEA, MYSIDACEA) FROM THE ARCTIC OCEAN AND CONFLUENT SEAS.

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ABSTRACT: Three species of mysids (Crustacea, Mysidacea), *Mysis litoralis*, *M. oculata*, and *M. polaris* were present in plankton collections from the East Siberian and Laptev seas. Two or three of these species frequently occurred together in these neritic areas strongly influenced by the runoff from rivers, while only *M. polaris* and *Boreomysis nobilis* were found in the Arctic Ocean and adjacent areas of deep water which are covered by ice. The occurrence of *M. litoralis* and *M. oculata* each in two distinct groups, characterized by different body lengths and development of secondary sexual characteristics, indicates that more than one year is needed for maturation and that the breeding season is limited for these species in Siberian seas. Size differences in *M. litoralis* juveniles from the East Siberian and Laptev seas are probably attributable to different lengths of time between spawning and collection rather than solely to environmental differences between the two seas.

INTRODUCTION

Geiger, Rodriguez, and Murillo (1968) found euphausiids in plankton samples from over the northern continental shelf of the U. S. S. R., except where there was a large discharge of fresh water from rivers. However, mysids (other stalk-eyed crustaceans) were abundant in the area of low salinity which lacked euphausiids. These mysids were of particular interest as they were from an area where previous information on distribution and life history was difficult to interpret. This difficulty resulted from changes which were made recently in the species composition of the arctic-subarctic members of the genus *Mysis*. Holmquist (1958) recognized *M. oculata* as a pair of species, *M. oculata* and *M. litoralis*. The specimens she designated as *M. litoralis* have the same morphology as the species originally described by Banner (1948) as *Pugetomysis litoralis*, which he later synonymized with *M. oculata* (Banner, 1954). Holmquist (1959b) also described a new species, *M. polaris*, on the basis of two specimens from widely separated northern locations.

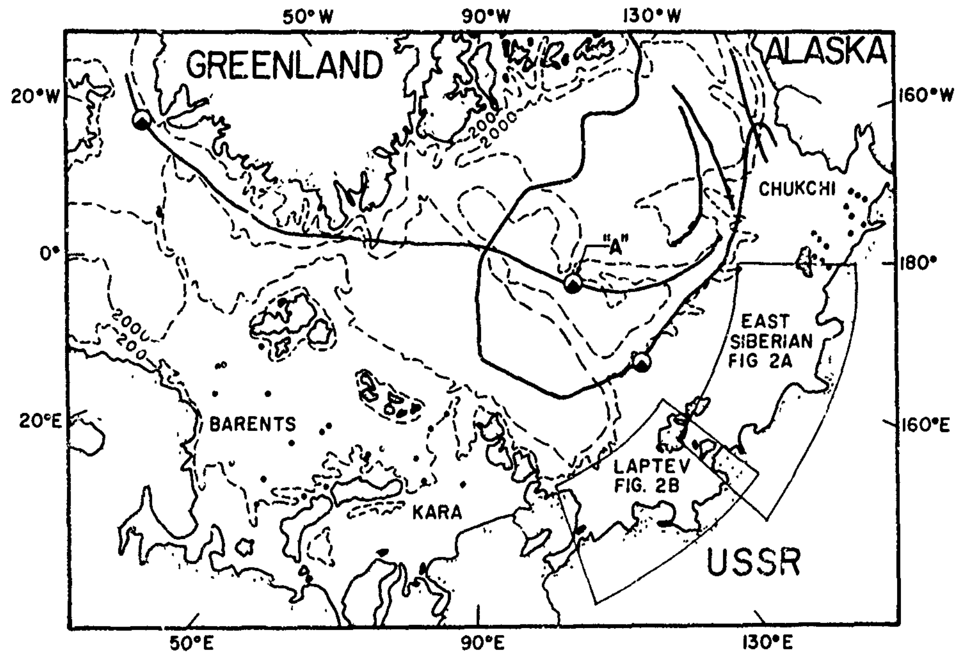

Figure 1. Location of plankton samples in Arctic Ocean and its confluent seas. Solid lines: drift of ice stations and path of SEADRAGON; dashed lines: depth contours in meters; partly darkened circle: presence of *Mysis polaris;* "A": five *M. polaris* at five stations; dot: absence of mysids Details of East Siberian and Laptev seas on Fig. 2.

Materials and Methods

Most of the specimens used in this study were collected from the USCGC NORTHWIND on a cruise over the Siberian continental shelf between the coast and the edge of the pack ice in 1963 (Figs. 1 and 2). Thirteen plankton hauls were made in the Chukchi Sea from August 9-12, 20 hauls in the East Siberian Sea from August 16-26, and 43 hauls in the Laptev Sea from August 26 to September 10. Other samples examined included 19 from the Barents Sea and 8 from the northern part of the Kara Sea, made during an August-September 1967 cruise of the USCGC EASTWIND; 90 samples from the nuclear powered submarine SEADRAGON on a cruise from McClure Strait in the Canadian Archipelago to Barrow, Alaska by way of the north pole in August and September 1960; and about 5000 samples from arctic drifting ice stations, over the Amerasia and Eurasia Basins and off the northeast coast of Greenland from September 1959 to May 1967.

Almost all of this plankton was caught in 1/2 m nets with mesh openings of 62, 73, or 215μ. The mesh used on the NORTHWIND had openings of 215μ and on the EASTWIND 73μ. All three sizes

were used from the drifting ice stations. The sampling device on the SEADRAGON used nets with mesh openings of 223μ. Nets in which mysids were caught were usually either towed vertically from near the bottom to the surface or horizontally at a given depth and then pulled open to the surface. Horizontal tows made from the NORTHWIND were about 10 minutes or less in duration, while those from the drifting station were from about 8 to 27 hours.

Mysids were measured from the anterior tip of the rostrum to the posterior end of the telson, excluding setae.

Distribution

Four species of mysids were in the plankton collections: *Mysis litoralis* (Banner), *M. oculata* (O. Fabricius), *M. polaris* Holmquist, and *Boreomysis nobilis* G. O. Sars. The occurrences of these species are listed below, first in neritic areas where they were most abundant, and then in other neritic and oceanic areas.

Sixty-one mysids were collected from 20 plankton tows made in the East Siberian Sea during the latter half of August 1963 in 3 horizontal, 3 vertical, and 1 oblique tows (Fig. 2A). *Mysis litoralis* was present in 5 of these tows. Most specimens: 18 females, 5 males, and 18 juveniles were taken in the oblique tow made at 71°31′N, 154°58′E in which the net was hauled from near the bottom (at 13m) to the surface. In the 5 tows (Fig. 3A) 37% were females, 10% males, and 53% juveniles. A 20 mm *M. oculata* female was caught in a horizontal surface tow. Horizontal, vertical, and oblique tows caught 7 *M. polaris:* a 16 mm female, a 16 mm male, and juveniles 7-9 mm long.

Three species of *Mysis* were present in 22 (15 horizontal and 7 vertical) of 43 plankton hauls made in the Laptev Sea between the end of August and mid-September 1963 (Fig. 2B). One hundred ninety-seven *M. litoralis* were taken in 17 tows: 11 horizontal and 6 vertical. In horizontal hauls 10% were females, 7% males, and 83% juveniles, while in vertical hauls 11% were females, 16% males, and 73% juveniles. A higher ratio of sexually differentiated individuals to juveniles occurred on the three occasions when the net touched bottom, but only 12 specimens were caught: 3 females, 3 males, and 6 juveniles. The size and frequency of the various developmental stages of *M. litoralis* from all samples is shown in Fig. 3B. Forty-six *M. oculata* were present at 5 stations: 3 horizontal and 2 vertical tows. Most were caught at 74°32′N, 127°00′E where a horizontal tow was made at 24 m, in 34 m of water. There were 13 females, 15 males, and 7 juveniles. Figure 3C gives the sizes and frequencies of the *M. oculata* from the

14-E

Laptev Sea. Eighteen *M. polaris* were taken at 13 stations: 8 horizontal and 5 vertical hauls. Three were females, 2 males, and 13 juveniles. Females were 16, 17, and 19 mm long, males 17 and 25 mm, and juveniles 7-12 mm.

Along the continental shelf and slope off northeast Greenland two species were collected from pelagic areas and four from bottom samples. A 20 mm long male *Mysis polaris* was taken in a dipnet at the surface of the sampling hole on April 22, 1965 when ice island ARLIS II was over 1170 m of water (Fig. 1). *Boreomysis nobilis*, a 23 mm individual without developed secondary sexual characteristics, was caught at 77°N, 11°W on February 26, 1965, in a vertical haul from 500 m to surface in 530 m of water. Off northeast Greenland *B. nobilis* and other mysids were taken in the same series of dredge hauls used by Stendell (1967) in his study of echinoderms, although perhaps significantly usually not in the same hauls in which echinoderms were present. The following species were recorded: *B. nobilis*, 2 specimens from 2 stations; *Michthyops théeli* (Ohlin), 7 from 4 stations; *Pseudomma frigidum*, H. J. Hansen, 5 from 3 stations, and *Parerythrops spectabilis* G. O. Sars, 2 from 2 stations. The species collected by dredge have been reported previously from dredged samples from East Greenland by Stephensen (1943) and others.

Mysids were not recovered from the Chukchi, Kara, or Barents seas or from over the continental shelf north of Alaska. This absence should not be interpreted as indicating an absence of this group from these areas, as their presence there has been established by the work of Linko (1908), Schmitt (1919), Banner (1954), Holmquist (1959a, 1963), and others.

Eight mysids were taken over deep areas of the Arctic Ocean. Interestingly, 6 of these were *Mysis polaris* (Fig. 1), of which 5 were taken in horizontal tows at 14 or 20 m over the Amerasia Basin between November 1962 and January 1963. All were juveniles between 9 and 12 mm long. The other *M. polaris* was a badly damaged specimen, about 15 mm long, collected as the SEADRAGON traveled at an average depth of 46 m, along the edge of the Siberian continental shelf in August 1960 (Fig. 1). *Boreomysis nobilis* was the only other species collected in plankton hauls in the Arctic Ocean. A 36 mm male was collected in December 1962 in the same series of samples which contained the 5 *M. polaris* mentioned above. It was collected in a horizontal haul at 505 m where the water depth was about 3000 m. The other specimen was a 33 mm long female collected in September 1965 over the Canada Basin at 75°21′N, 140°53′W in a horizontal tow at 100 m where the water depth was 3675 m.

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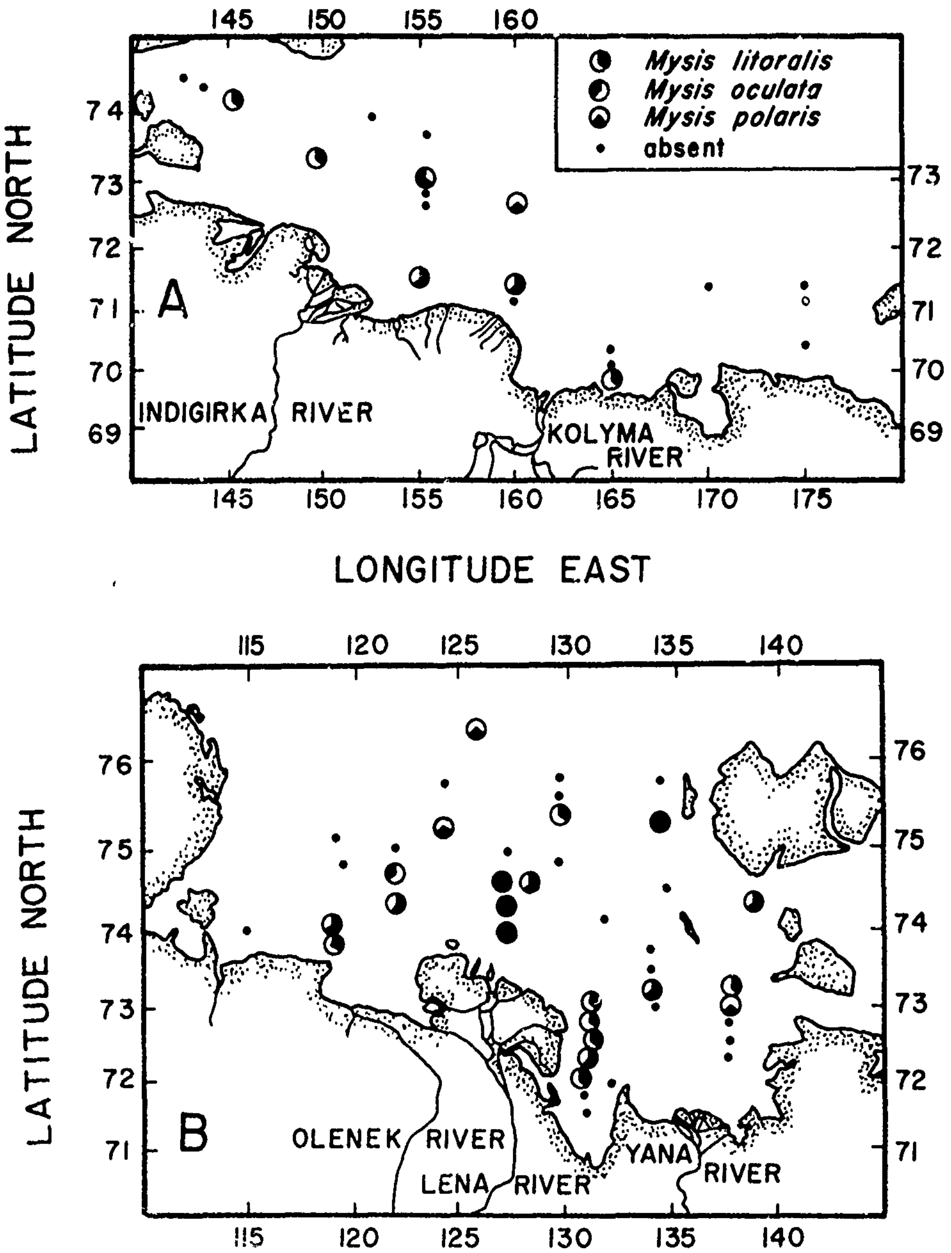

Figure 2. Presence of *Mysis* in plankton samples. A. East Siberian Sea; B. Laptev Sea.

Development

Size and development of the oostegites and fourth pair of pleopods of *Mysis litoralis* varied considerably. In most females under 20 mm long the posterior pair of oostegites did not extend anterior to the sixth pair of thoracic appendages, while in those 20 mm or over these oostegites extended anterior to the sixth pair of thoracic appendages. Males in which the fourth pair of pleopods did not reach the posterior

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end of the sixth abdominal segment were, with one exception, shorter than 21 mm; those in which this pair of pleopods extended beyond the posterior end of the sixth abdominal segment were, with one exception, 19 mm or longer. *M. oculata* was much less variable in length and likewise the oostegites and fourth pair of pleopods were in a more uniform stage of development. The last pair of oostegites extended anterior to the sixth pair of thoracic appendages except in two females, and the fourth pair of pleopods reached or extended posterior to the end of the sixth abdominal segment in all of the males. In the four female *M. polaris* the posterior pair of oostegites did not reach the sixth pair of thoracic appendages; in the males the fourth pair of pleopods reached almost to the middle of the sixth abdominal segment in two specimens and to the posterior end of that segment in the other two.

Only in *Mysis litoralis* were juvenile mysids sufficiently abundant to permit a comparison of length of individuals obtained from two areas. The East Siberian Sea juveniles had a mean length of 6.7 mm; more than one-fourth of the juveniles from the Laptev Sea were longer than those from the East Siberian Sea, and their mean length was 8.5 mm.

No mysids were found with embryos or larvae in the marsupium.

Commensals

A dajid isopod was removed from between the eighth thoracic appendages of a juvenile *Mysis polaris* collected in the Arctic Ocean at 84°24′N, 169°02′E in December 1962. Dr. Charles G. Danforth, of California State College at Los Angeles, has tentatively identified it as an immature female of *Holophryxus alaskensis* Richardson. Several mysids examined in this study were infested with commensal ciliate protozoans, which are now under study by Dr. John L. Mohr of the University of Southern California.

Discussion

Most mysids were caught in the East Siberian and Laptev seas, where oceanographic data collected at the same time as the mysids showed that the water depth was from 10-49 m and the fresh water intrusion from large rivers was great (U. S. Coast Guard, 1965). Two or three of the predominant species, *Mysis litoralis, M. oculata,* and *M. polaris,* were often caught together in either horizontal or vertical tows and therefore information on the ecological separation of the species was limited. *M. litoralis* was more abundant than *M. oculata*, as has been

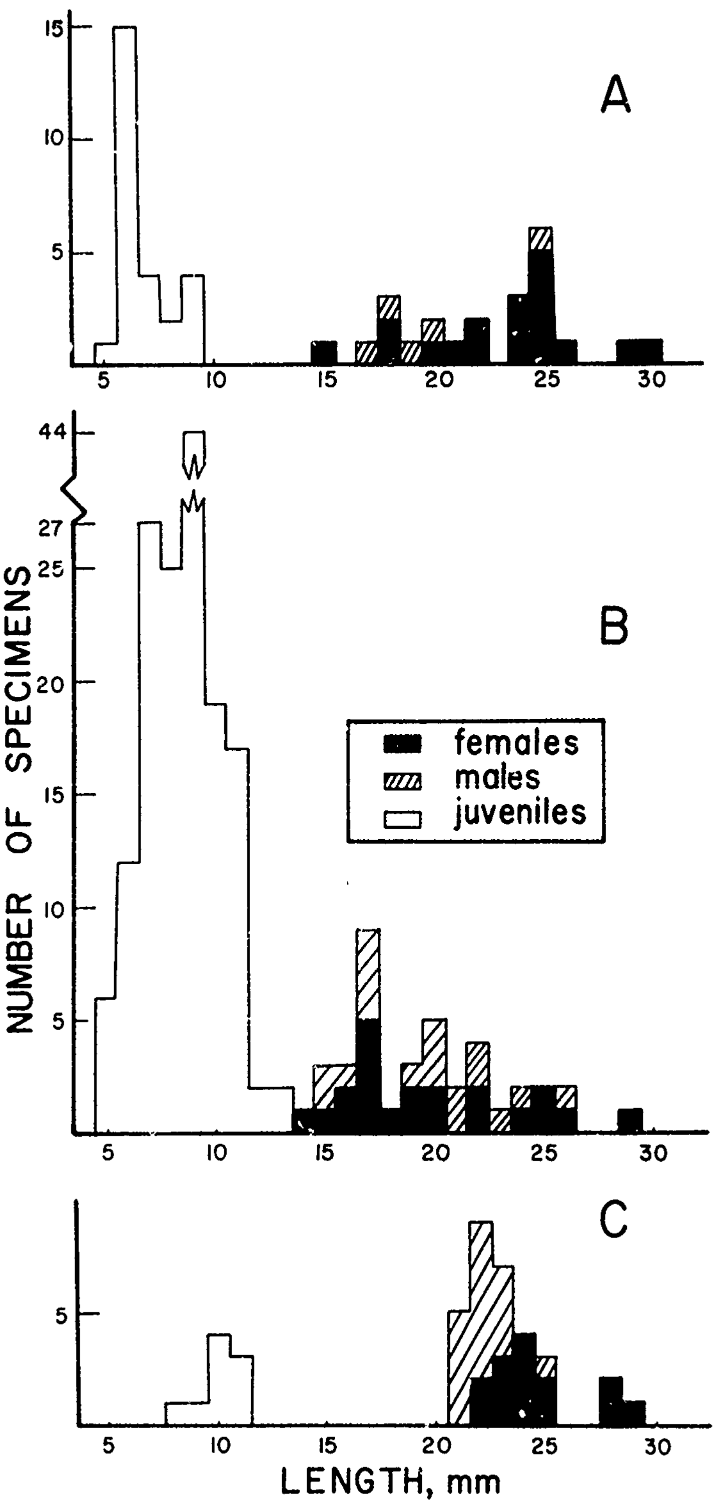

Figure 3. Mysis of various lengths and developmental stages. A. *M. litoralis* from East Siberian Sea; B. *M. litoralis* from Laptev Sea; C. *M. oculata* from Laptev Sea.

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reported by Holmquist (1963) around Barrow, Alaska, but off western Greenland *M. oculata* is more abundant (Holmquist, 1959a). The occurrence of *M. polaris* in the East Siberian Sea, Laptev Sea, off northeast Greenland, and in the Arctic Ocean demonstrates this to be a more widely distributed and abundant species than was previously believed (Holmquist, 1959b). Its occurrence at several locations within the Arctic Ocean beyond the edge of the continental shelf, and the absence of *M. litoralis* or *M. oculata*, suggests a greater tolerance to under-ice conditions and suggests that *M. polaris* lives toward the edge of the continental shelf and is carried from there by currents into oceanic areas. *Boreomysis nobilis* is from a genus whose members are usually found in or over deep areas (Stephensen, 1943; Tattersall, 1955), but the extent of its establishment in the Arctic Basin needs further study.

The distinct separation, in August and September samples, of *Mysis litoralis* and *M. oculata* each into two size groups suggests that they do not mature in one year along the Siberian continental shelf. Such a bimodal distribution of specimens of various sizes also suggests a limited breeding season. Holmquist's (1959a) findings for these species, based on dredged samples from Greenland fjords, suggest more rapid maturation but also indicate a limited breeding season. Other species of mysids from temperate regions spawn at various times of the year (Tattersall and Tattersall, 1951; Mauchline, 1968). Such spawning produces a continuum of lengths and stage of development of sexual characteristics, and leads to the occurrence of females with young throughout the year. The largest adults of *M. litoralis* and *M. oculata* that have been reported occur in Siberian seas (Holmquist, 1959a) and our samples from that area also include large specimens. The greater length of juveniles from the Laptev Sea, compared to the East Siberian Sea, probably results from differences in the time between spawning and collection, rather than from an entirely environmental difference between the two seas.

Acknowledgments

Dr. Charles G. Danforth kindly identified the isopod found on *Mysis polaris*. Use of the laboratory and library facilities of the Allan Hancock Foundation of the University of Southern California is gratefully acknowledged. This research was supported by contract NONR 228 (19), NR 307-270, between the Arctic Program, Office of Naval Research, Department of the Navy, and the University of Southern California.

14-J

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Planktonic Mysids of the Arctic Ocean

1a. Rostral plate with antero-lateral spiniform projections; statocyst small; with 7 pairs of oostegites in female; pleopods of male well-developed. . . . . <u>Boreomysis</u> (Fig. 4a)

(a) Rostral plate produced into a single median rostrum; tip of antennal scale transversely truncated (25-36 mm). . . . . <u>B. nobilis</u> (Figs. 4a, 5)

(b) Antennal scale 5 times as long as broad (27 mm). . . . . <u>B. arctica</u>*

1b. Rostral plate without antero-lateral spiniform projections; statocyst large; with 2 pairs of oostegites in female; pleopods of male variable. . . . . <u>Mysis</u> (Fig. 4b)

(a) Uropod. inner margin of endopod with 1 spine; antennal scale elongated and apically blunt (15-25 mm). . . . . <u>M. polaris</u> (Fig. 9a)

(b) Uropod, inner margin of endopod with 4 spines; telson almost equal in length to 6th abdominal segment (16 mm). . . . . <u>M. relicta</u>* (Fig. 9b)

(c) Uropod inner margin of endopod with 6 spines; carapace evenly rounded (20-25 mm). . . . . <u>M. litoralis</u> (Fig. 9c)

(d) Uropod, inner margin of endopod with 7-8 spines; antennal scale 5 or 6 times as long as broad (22-24 mm). . . . . <u>M. oculata</u> (Fig. 9d)

*See notes.

Field Guide to Some Bottom Dwelling Mysids of the Arctic

1a. Eyes well-developed and pigmented; carapace short and broad; telson long and narrowly triangular; 3 pairs of oostegites in female. _Parerythrops_ (Fig. 7)

(a) Apex of telson with 3 pairs of graduated spines and a pair of median setae (20-25mm). . . . . _P. spectabilis_ (Fig. 7)

1b. Eyes rudimentary, non-pigmented and fused to form a median plate; carapace either narrow or rounded; telson relatively short and not triangular; 2 pairs of oostegites in female. 2

2a. Carapace relatively small; cervical groove conspicuous; eyeplate quadrangular with a median cleft; pleopod biramous in male. _Pseudomma_ (Fig. 6b)

(a) Antennal scale naked and truncated in a short spine (25-30 mm). . . . . _P. frigidium_ (Fig. 6b)

2b. Carapace moderately large; cervical groove not well marked; eyeplate triangular without a median cleft; pleopod uniramous in male. . . . . .Michthyops (Fig. 6a)

(a) 6th abdominal segment twice as long as 5th; 5th pleopod extending beyond the posterior margin of 6th abdominal segment (22-35 mm). . . . . ._M. theeli_ (Fig. 8)

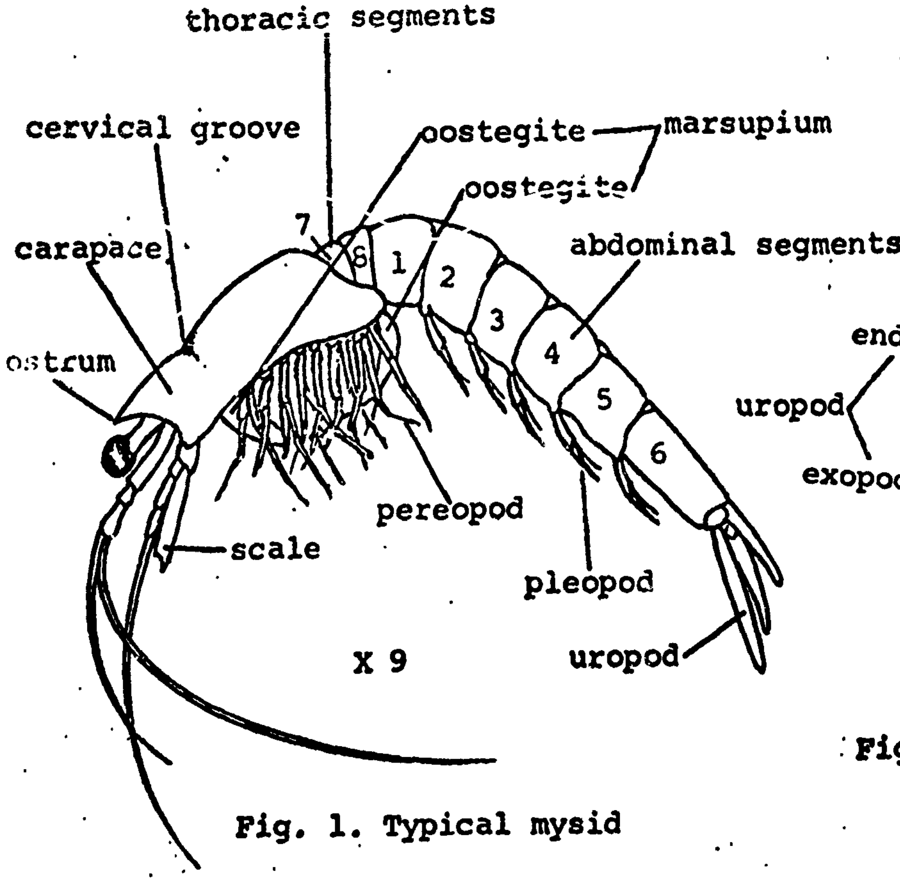

Fig. 1. Typical mysid

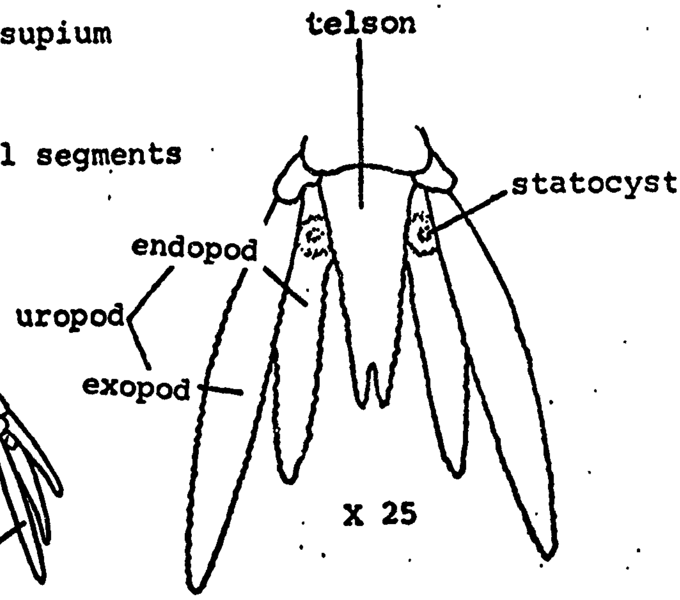

Fig. 2. Telson and Uropod

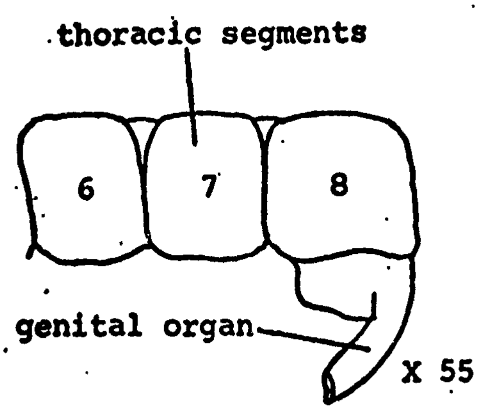

Fig. 3. Thoracic segments with carapace removed.

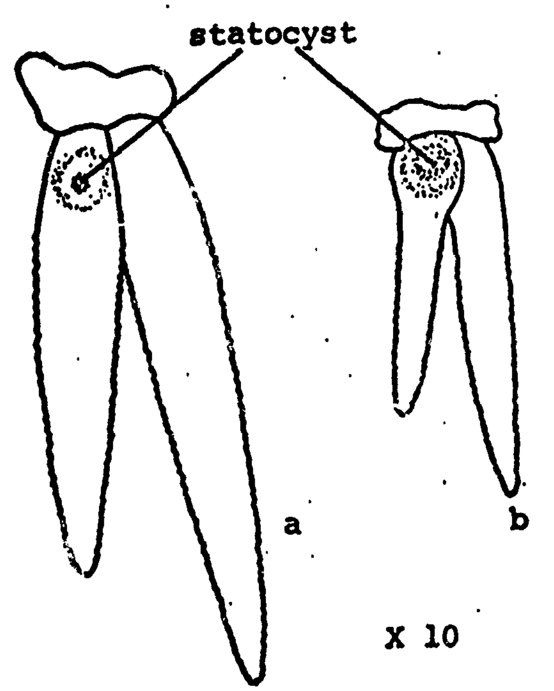

Fig. 4. Statocysts of mysids
a. Boreomysis; b. Mysis

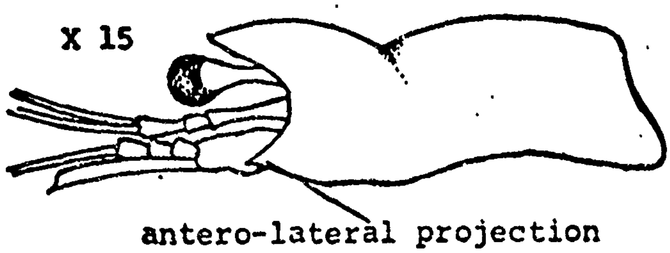

Fig. 5. Boreomysis nobilis

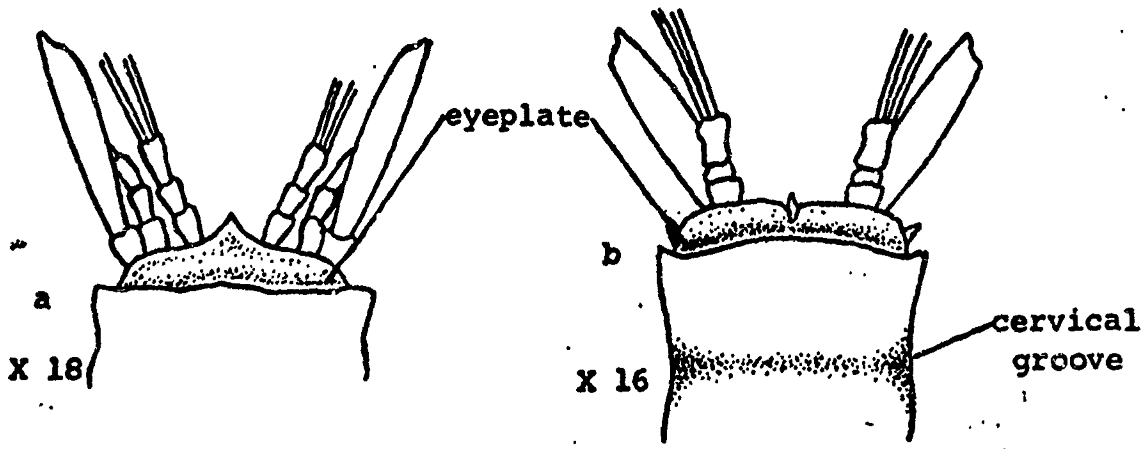

Fig. 6. Eyeplates of mysids: a. Michthyops; b. Pseudomma

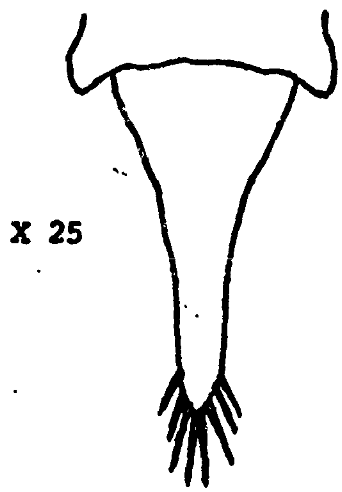

Fig. 7. Telson of Parerythrops spectabilis.

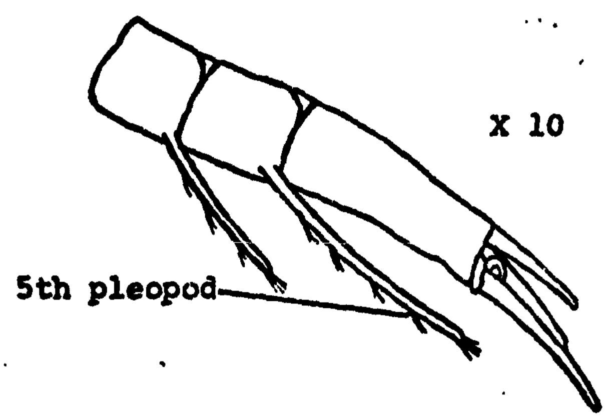

Fig. 8. Michthyops theeli showing th posterior end of the abdomen. (lateral view)

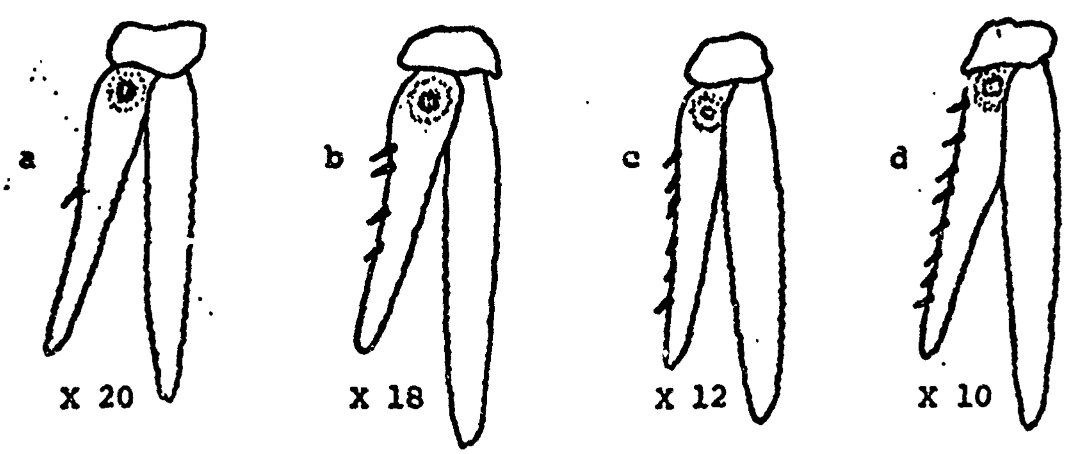

Fig. 9. Uropods of Mysis, showing arrangement of the spines (with setae removed) a. M. polaris; b. M. relicta; c. M. litoralis; d. M. oculata.

Notes:

1. Boreomysis arctica: B. arctica (Tattersall and Tattersall, 1951) has not been found in Arctic collections, however its presence along western Greenland and the Bering Strait suggests that it may be found in the Arctic Ocean.

2. Bottom dwellers: Pseudomma frigidium, Parerythrops spectabilis and Michthyops theeli are not planktonic forms. The only records in our collections have come from dredge hauls off northeastern Greenland from ARLIS II.

3. Central Arctic Species: Mysis polaris and Boreomysis nobilis are the only plankton species yet recorded in the central Arctic.

4. General Planktonic Species: Mysis litoralis, M. oculata, M. polaris and Boreomysis nobilis have been found amongst plankton collections from the central Arctic Ocean and the peripheral seas.

5. Mysis relicta: M. relicta, a predominantly freshwater to brackish water form, has also been found occasionally in the ocean in the vicinity of Barrow in association with Mysis oculata and Mysis litoralis (Holmquist, 1963). Its similarity to these species has often caused confusion in Arctic mysid records (Holmquist, 1963).

6. Sexual differentiation: Females possess marsupia composed of 2 to 7 oostegites arising from the second and eighth pereopods (Fig. 1). Openings of oviducts can be found at the bases of the sixth pereopods. Males have paired genital organs at the base of the eighth pereopods (Fig. 3).

7. Sizes: Size or size range of adult specimens is provided in the key.

Classification

Class: Crustacea

Superorder: Peracarida

Order: Mysidacea

Suborder: Mysida

Family: Mysidae

Subfamily: Boreomysinae

Genus: Boreomysis

Boreomysis nobilis Sars
Boreomysis arctica (Kroyer)

Subfamily: Mysinae

Genus: Parerythrops

Parerythrops spectabilis Sars

Genus: Pseudomma

Pseudomma frigidum Hansen

Genus: Michthyops

Michthyops theeli (Ohlin)

Genus: Mysis

Mysis polaris Holmquist
Mysis oculata (Fabricius)
Mysis litoralis (Banner)
Mysis relicta Lovén

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Field Guide to Arctic Zooplanktonic Crustaceans

Introduction

Crustaceans are the most prominent constituents of the Arctic zooplankton. With the exception of the ostracod which has diverged from the general plan, some of the members, particularly the shrimp-like forms such as mysids, decapods, and euphausiids, look much alike and are easily confused by non-specialists. This field guide points out external features significant for the separation of these groups.

Specific information on the different groups is available in pertinent USC technical reports listed on page 2.

The scale provided with each Figure indicates the size of the organism illustrated and not necessarily a size limit of species in the group.

Field Guide to the Arctic Zooplanktonic Crustaceans

1a. Carapace absent; eye, if present, sessile and lateral. 2

1b. Carapace present; eye stalked and not lateral. 4

2a. 2nd and 3rd thoracic appendages variously modified as gnathopods; thorax and abdomen not distinctly demarcated. . . . . .Amphipod (Fig. 1)

2b. 2nd and 3rd thoracic appendages not modified as gnathopods; thorax and abdomen distinctly demarcated. 3

3a. Body cylindrical; compound eye absent; abdomen narrower than thorax and without appendages. . . . . Copepod (Fig. 2)

3b. Body dorso-ventrally flattened; compound eye present; abdomen almost as wide as thorax and with appendages. . . . . Isopod (Fig. 3)

4a. Thoracic appendages not modified as maxillipeds; gills exposed on side of thorax; with a photophore on coxa of 7th thoracic appendages and one on each of the first 4 abdominal segments. . . . . .Euphausiid (Fig. 4)

4b. First 2 or 3 pairs of thoracic appendages modified as maxillipeds; gills not exposed on side of thorax; without a photophore on coxa of 7th thoracic appendages and each of the first 4 abdominal segments. 5

5a. First 2 or 3 pairs of thoracic appendages modified as chelae; pleopods well developed; without a statocyst at the base of each uropod. . . . . Decapod (Fig. 5)

5b. First 2 or 3 pairs of thoracic appendages not modified as chelae; pleopods often reduced; with a statocyst at the base of each uropod. . . . . Mysid (Fig. 6)

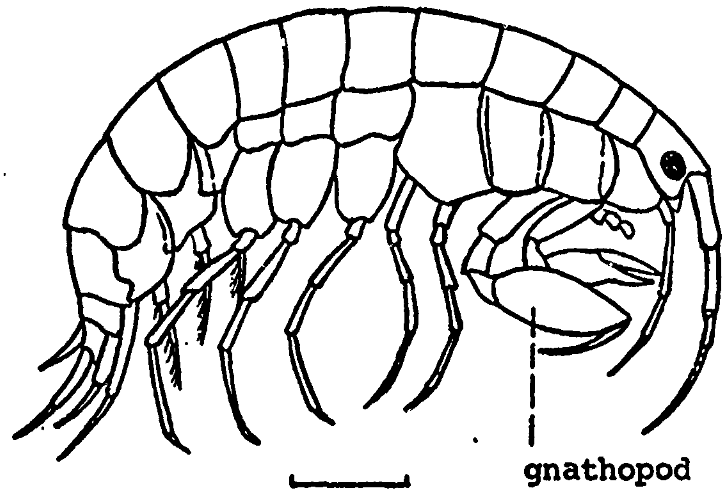
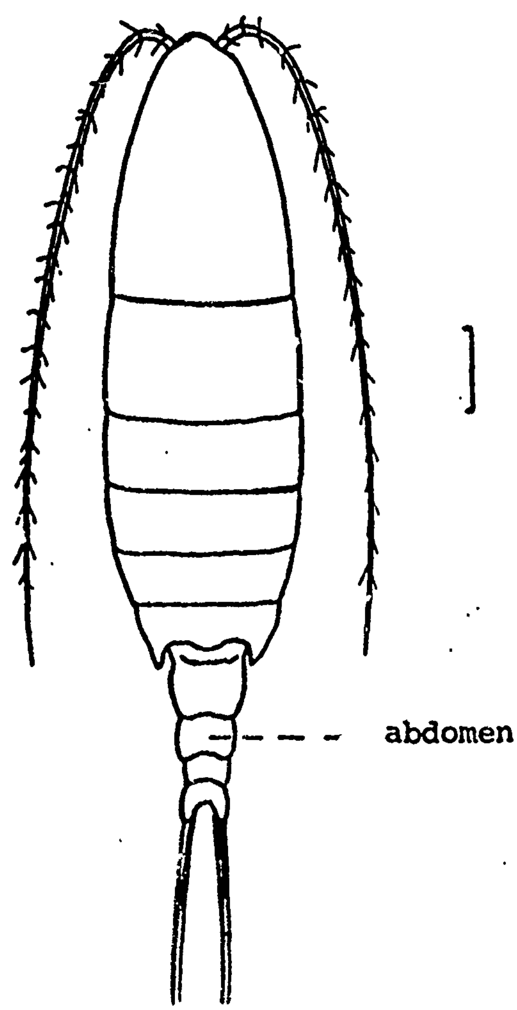


Fig. 1 Amphipod



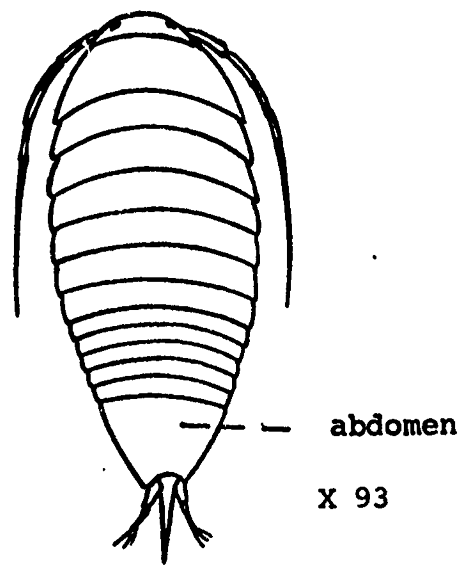


Fig. 3 Isopod

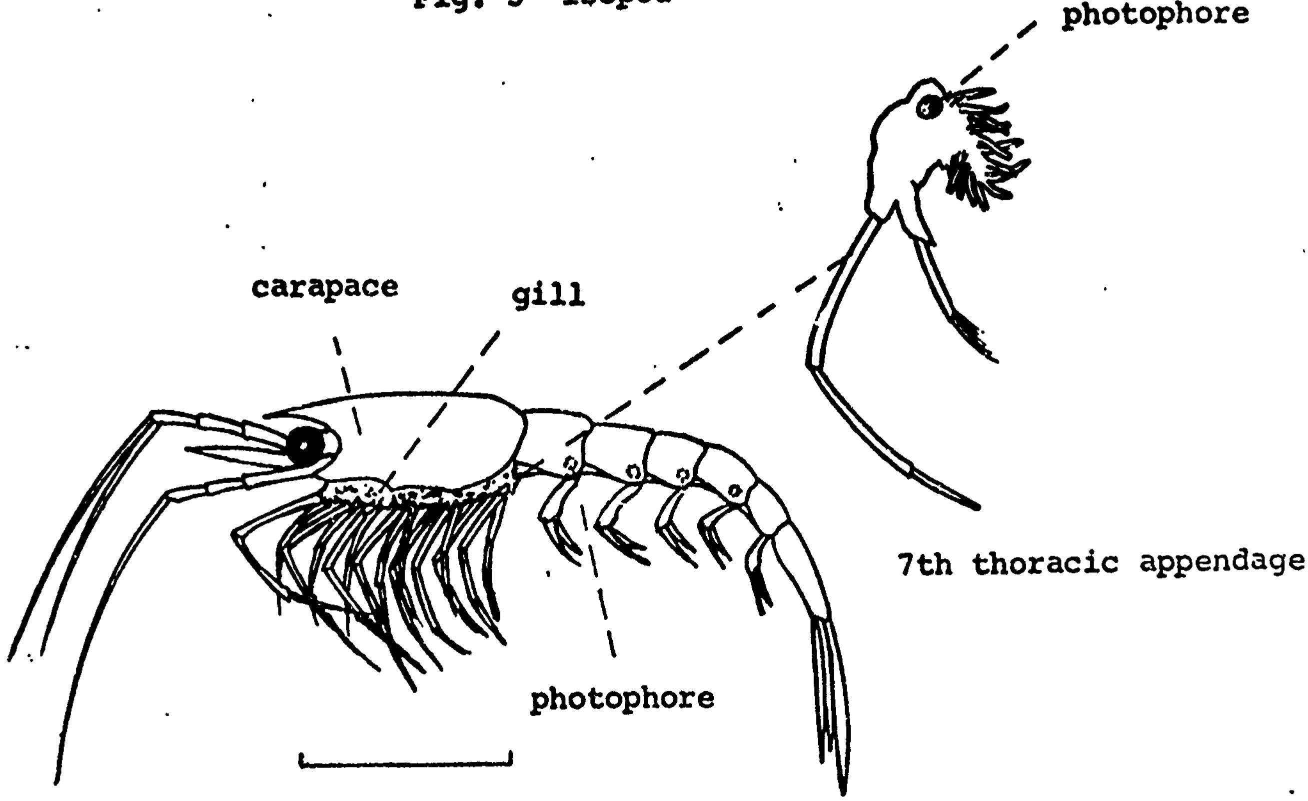


Fig. 4 Euphausiid

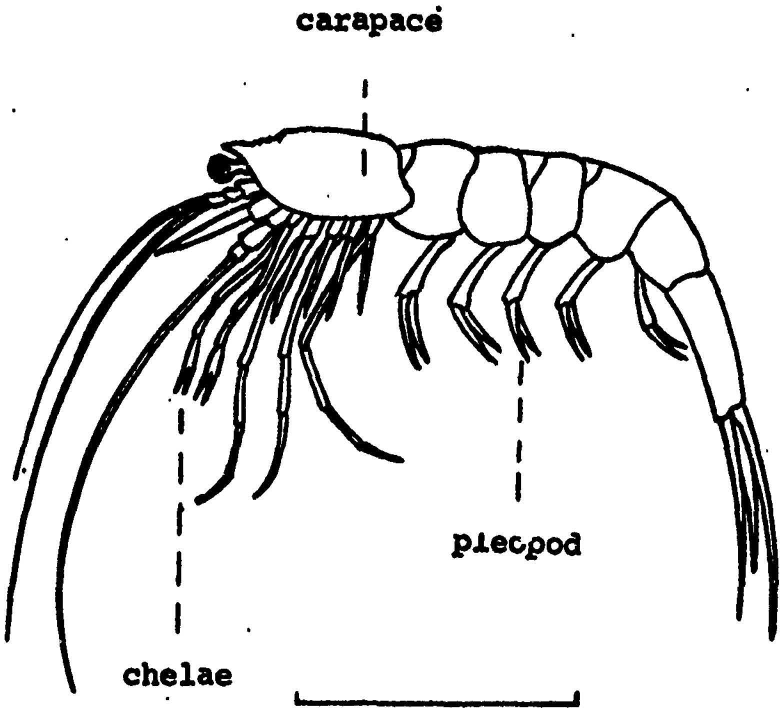


Fig. 5 Decapod

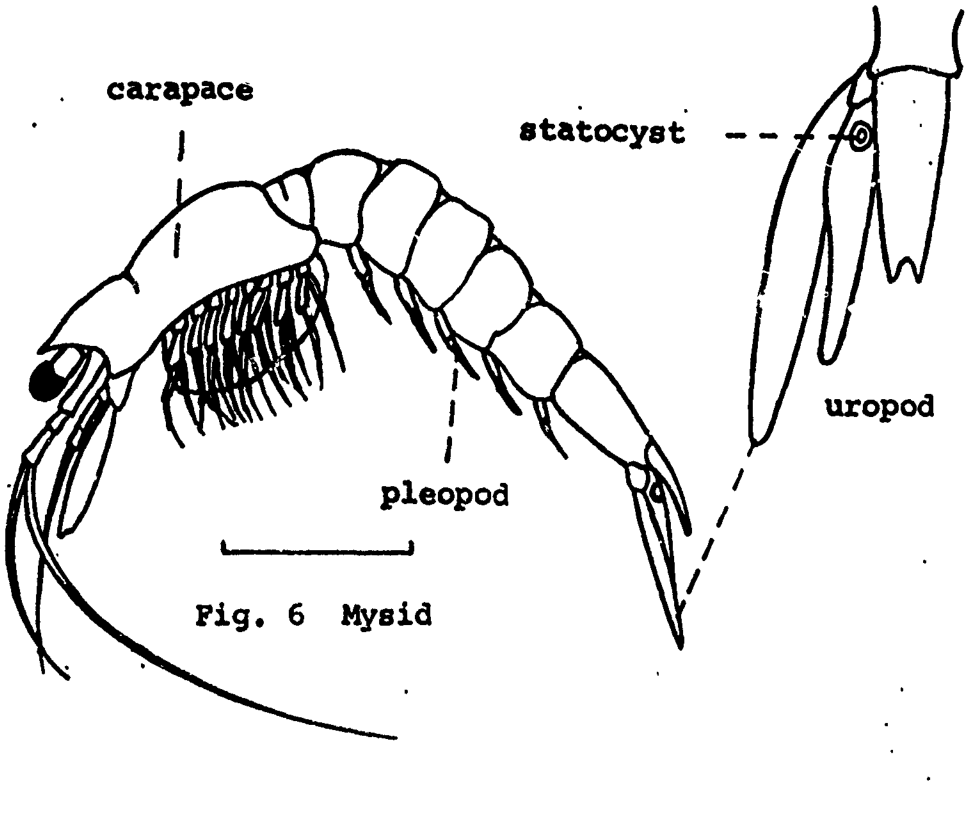


Fig. 6 Mysid

Ostracods of the Central Arctic Ocean

Introduction

The ostracod is a small crustacean whose body and appendages are enclosed in a bivalved carapace. Because of its resemblance to a small mussel, this animal is commonly referred to as "mussel shrimp". Arctic species range in length from 0.7 to 3.6 mm as adults.

Five species have been hitherto recorded from the Central Arctic; only two species (Mohr and Geiger, 1968), however, had been known until this study of specimens from ice stations ARLIS I, ARLIS II, and T-3 was conducted. A separate publication is now under preparation by Yuk maan Leung covering the taxonomy of Arctic ostracods. Each species is treated separately below to stress its taxonomic record in the Arctic and the technique by which it has been collected.

The dichotomous key should be used in close association with the provided figures as terminology and body orientation can only be obtained by reference to the latter.

Species of Central Arctic Ostracods

Acetabulastoma arcticum Schornikov
Parasitic form found on *Gammarus wilkitzkii* and *G. loricatus*, amphipods found among zooplankton as well as among the underice fauna.
This form was earlier identified by Baker and Wong (1968) as *Paradoxostoma rostratum* Sars, however was reidentified by Schornikov (1970) as a new species.

Bathyconchoecia sp.
New to science. Dr. Martin Angel of the National Institution of Oceanography, England, is in the process of describing the specimen.
This genus has been previously collected from the stomach and intestines of benthic fish caught in the Gulf of Mexico.
Arctic specimen was caught in baited wire mesh trap at 83°N from T-3.

Conchoecia borealis maxima Brady and Norman
Most common species in the Central Arctic.
Specimens collected in vertical tows throughout the water column.

Chonchoecia elegans Sars
A new record in the central Arctic Ocean.
Relatively common species in vertical tows from T-3 and ARLIS I.
Often found in association with *C. borealis maxima*.

Conchoecia skogsbergi (Iles)
A new record in the Arctic Ocean.
Species abundant in the Norwegian Sea but never before reported from the Arctic Ocean.
Arctic specimen collected in net tows (plankton) at 85°58'N from T-3.

Field Guide to the Central Arctic Ostracods

1a. Rostrum not developed; eyes present; shell firm and "hairy" (Paradoxostomatidae). . . . .<u>Acetabulastoma arcticum</u>
Fig. 5 (.7mm)

1b. Rostrum well developed; eyes absent; shell thin and "not hairy" (Halocyprididae). . . .2

2a. Height of shell exceeding half of the length; terminal segment of 1st antenna with more than 5 setae or sensory filaments (<u>Bathyconchoecia</u>) . . .<u>Bathyconchoecia</u> sp.
Fig. 4 (2.1 mm)

2b. Height of shell not exceeding half of the length; terminal segment of 1st antenna with 5 setae or sensory filaments (<u>Conchoecia</u>) 3

3a. Shell cylindrical; posterodorsal angle without denticles; gland cells present in shells. . . . .<u>Conchoecia skogsbergi</u>
Fig. 6 (1.4 mm)

3b. Shell wedge shaped; posterodorsal angle with 2-4 denticles; no gland cells. 4

4a. Dorsal margin with a depression near the middle; upper posterior corner of right valve without a spiniform point. . . . . <u>Conchoecia borealis maxima</u>
Fig. 7 (3.6 mm)

4b. Dorsal margin without a depression near the middle; upper posterior corner of right valve with a spiniform point. . . . . <u>Conchoecia elegans</u>
Fig. 8 (2.3 mm)

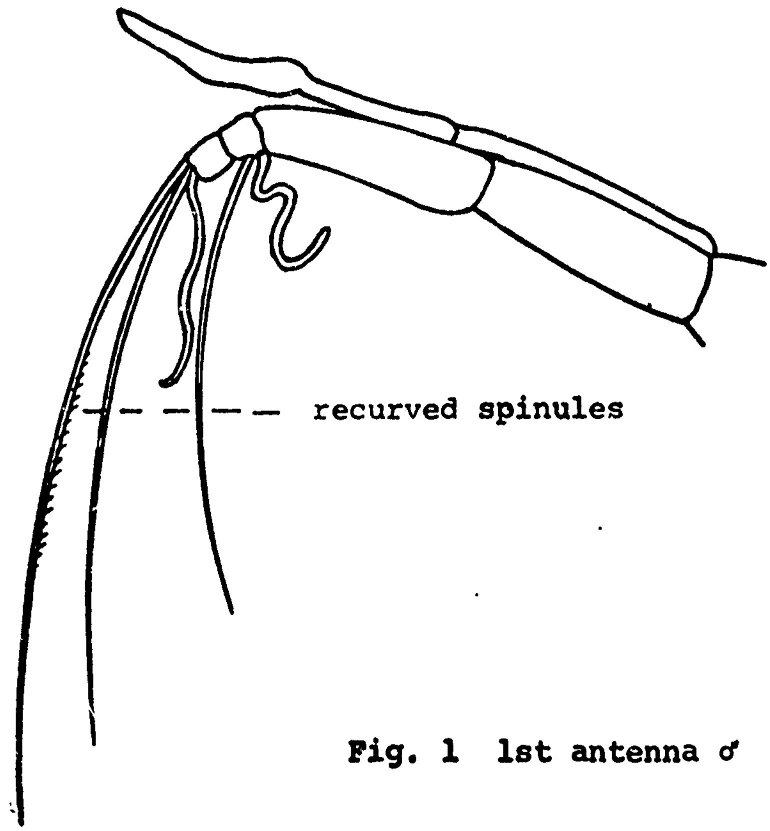


Fig. 1 **1st antenna ♂**

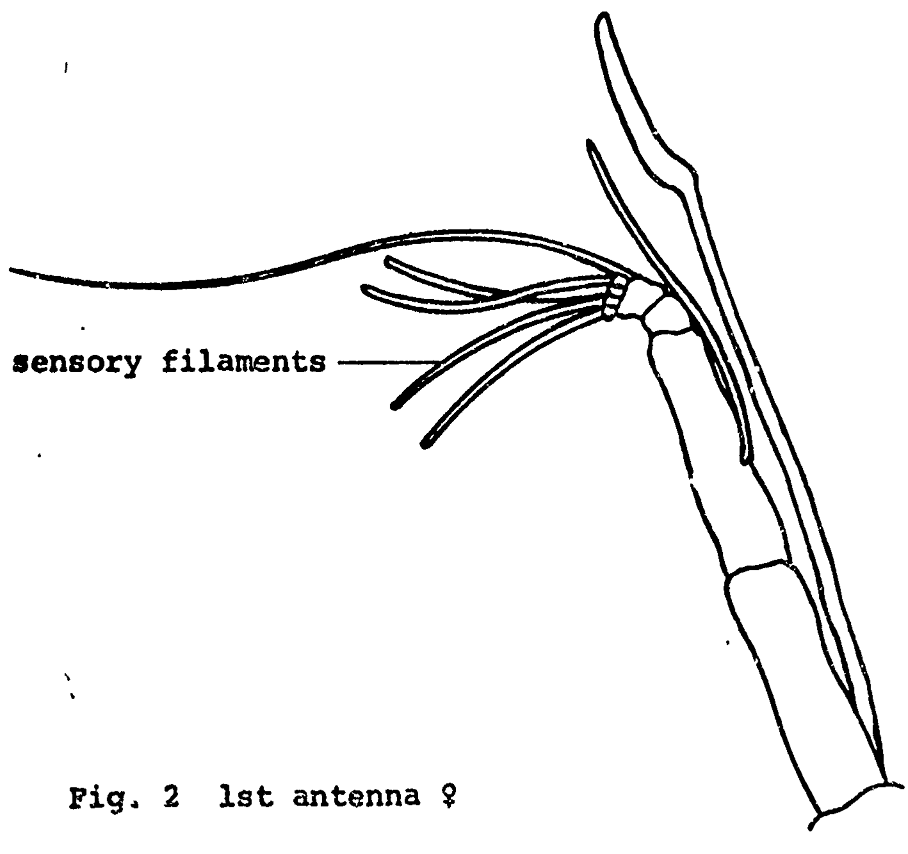


Fig. 2 1st antenna ♀

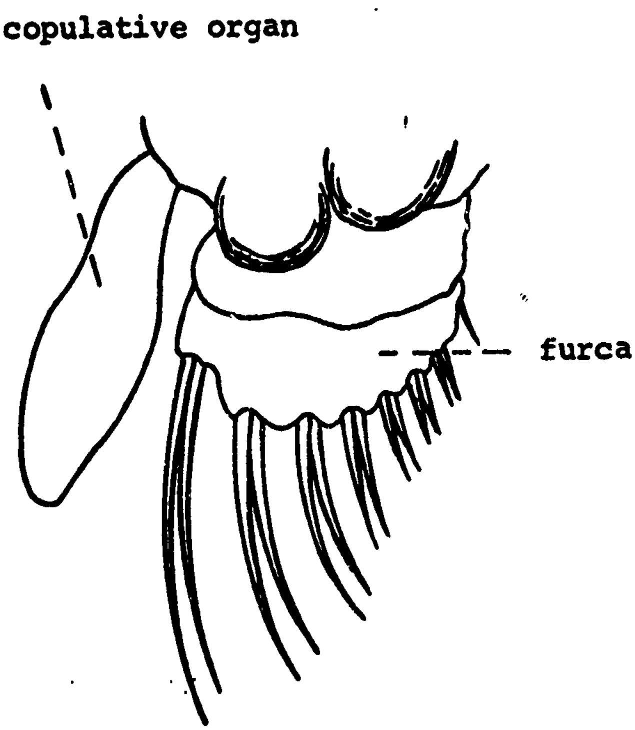


Fig. 3 ♂ copulative organ
and furca X 78

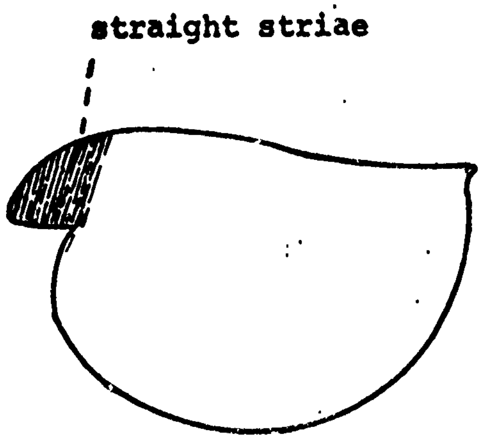


Fig. 4 Bathychoncoecia sp.
left valve X 30

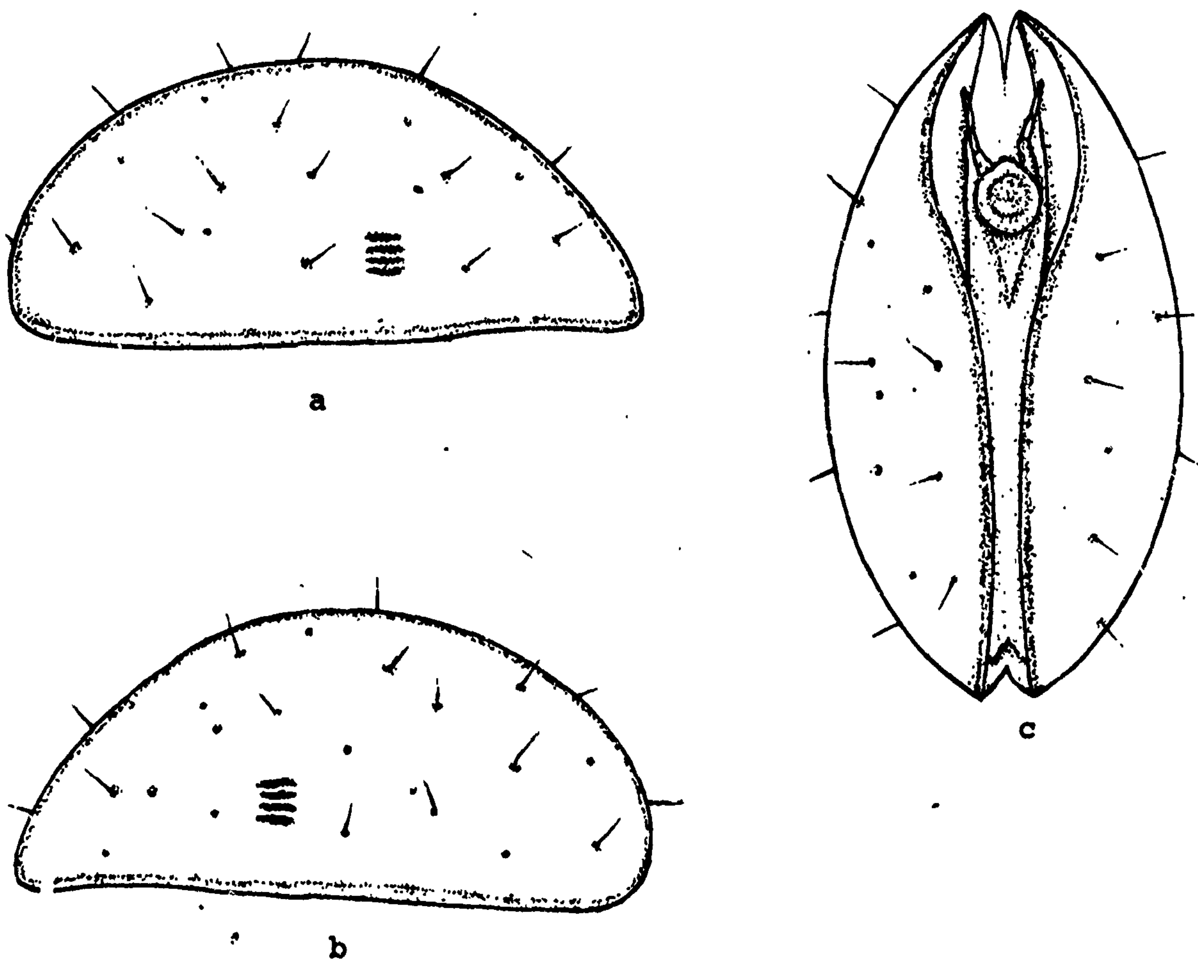


Fig. 5 Acetabulastoma arcticum (=Paradoxostoma rostratum of Baker and Wong) X 120. a. right valve; b. left valve; c. ventral view of shell.

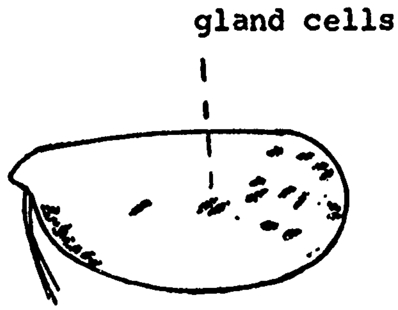


Fig. 6 Conchoecia skogsbergi
left valve X 30

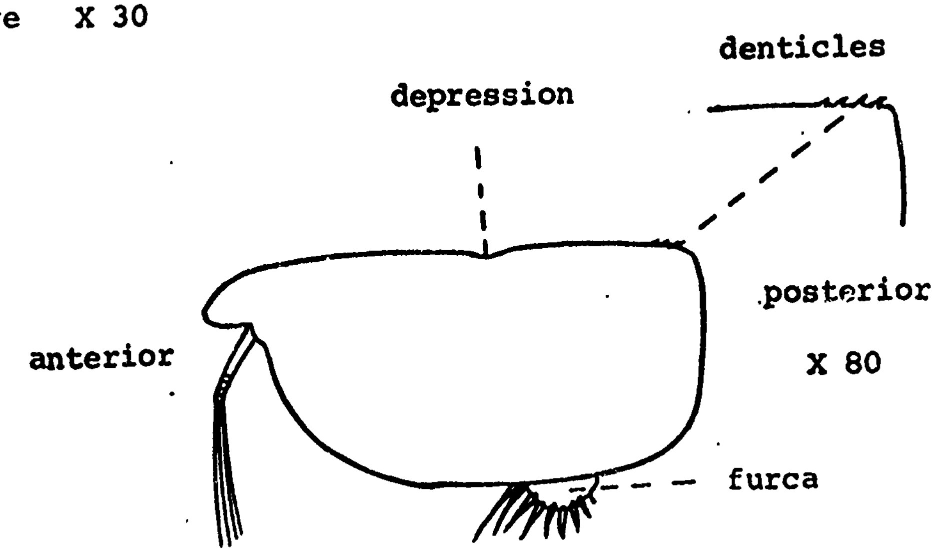


Fig. 7 Conchoecia borealis maxima ♀
left valve X 20

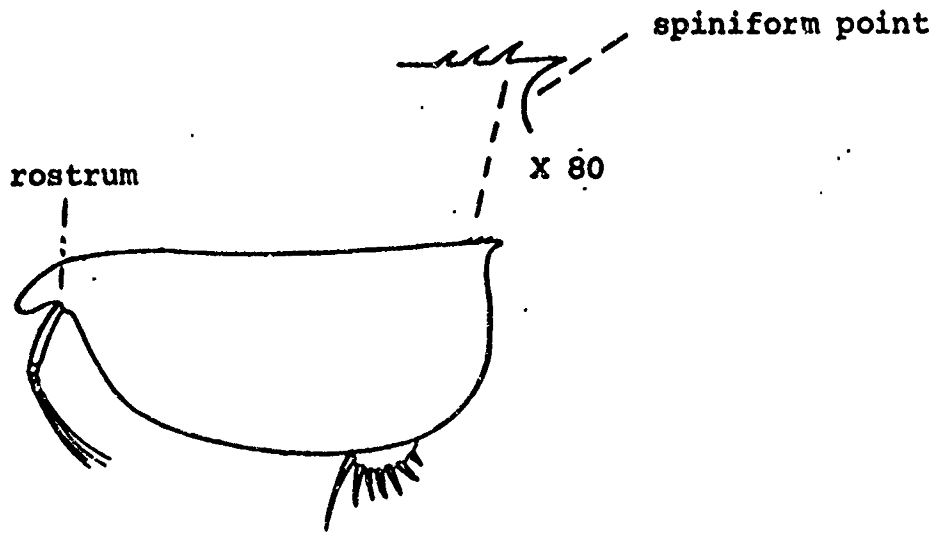


Fig. 8 Conchoecia elegans ♀
left valve X 30

Notes:

Sexual dimorphism in Conchoecia-

1. The male is usually smaller and narrower than the female in overall size.

2. The stem of the first antennae in the male is more powerfully built than in the female and is armed in the middle of the long seta with a series of short spinules (Fig. 1).

3. The male copulative organ is located at some distance from the furca on the left side of the abdomen (Fig. 3).

Classification

Class Crustacea

Subclass Ostracoda

Order Myodocopa

Suborder Halocypriformes

Family Halicyprodidae

Subfamily Conchoeciinae

Genus *Conchoecia*

C. *skogsbergi* (Iles)
C. *borealis* *maxima* Brady and Norman
C. *elegans* G. O. Sars

Genus *Bathyconchoecia*
B. sp. nov.

Suborder Podocopa

Family Paradoxostomatidae

Subfamily Paradoxostominae

Genus *Acetabulastoma*
A. *arcticum* Schornikov

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